SIMPLIFIED LESSONS ON PROPER CARE OF AUTOS

How Piston Rings in a Cylinder of Smaller Diameter Act as Springs.

RINGS MAKE PISTON AIRTIGHT

Frederick C. Guerrlich Tells of Three Essentials for Successful Running of an Auto Engine—"Queries and Answers" Aid to Car Owners.

LESSON N. 3.
The Three Essentials.
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For the successful running of an automobile engine, we must have three things, namely: a perfect explosive mixture, and perfect ignition. If any one of these three fail or is not perfect, the engine will either miss, lack power or possibly not run at all.

It is extremely important for the reader to clearly understand the above paragraph, as this will give him a foundation for the successful diagnosing of engine troubles and for the solving of his engine problems.

In later articles we will take up the question of mixture and of ignition. Let us now take up the question of compression.

The Piston Rings.

If you will refer to the cut, you will see that at the top of the piston are cut a number of grooves, and that in these grooves are inserted castiron rings, called piston rings. These rings (Figure 2) are slightly larger in diameter than the cylinder, but have a piece cut out of them about one-half inch long. Thus they can be pressed together this amount, and can, therefore, be put into a cylinder which is of small diameter. They will, however, try to take their original diameter, and thus will act as springs, pressing out against the cylinder walls. The cut shows, on the right, the position the rings take in the cylinder, while, on the left their position on the piston before being placed in the cylinder is shown.

The piston itself cannot be made to fit into the cylinder so snugly as to be airtight, as due to the heat of the combustion of the gaseous mixture above the piston, it will expand, and if it were to fit snugly, it would, due to this expansion, bind in the cylinder, or, as mechanics say, it will "freeze up," though they really mean heat up.

As, due to the required clearance, the piston cannot be made airtight, the piston rings are placed on them so as to spring out, and thus make the piston airtight, so that we can get good compression.

You can readily see that the failure of the piston rings to function properly will cause a loss of compression and thus a loss of power. These rings may fail, due to becoming broken or worn, or to carbon getting between them and their grooves, thus causing them to stick and not spring out against the cylinder walls.

These rings, being of castiron, which is extremely brittle, must be exceedingly well made. Fortunately, there are a number of concerns to-day that devote all their time and thought to the manufacture of these rings, turning out rings which are well-night perfect. It would be wise when replacing rings for owners not to be "penny wise and pound foolish" when buying new rings.

Where Compression Is Lost.

While I have mentioned the rings first in talking of compression, this is by no means the place where compression leakage is most often found. The place where the leakage is most likely to occur is at the valve caps, these being the plugs or covers which close the hole in the top of the cylinder, cut there to allow the valve to be taken out.

The writer has found that, if when screwing the valve caps back, a paste, made up of flake graphite and shellac, is smeared on the threads, it will help much to make the caps tight.

Loss of compression is also often found where the spark plugs, or compression cocks, are screwed into the cylinder. A little graphite grease on the threads of these will help.

The next place where loss of compression is liable to occur is at the valves themselves. This may be due to the valve stems sticking in their guides; to the adjusting screws on the valve lifters being up too high, so that the valves do not seat properly; to the valve head being warped due to the heat, or to the fact that the valves need to be ground in.

After a car has been run a little over 1,500 miles, the valves, especially the exhaust valves, will have small holes burned in them, or, as the saying is become pitted. These pits allow the compression to escape so that they must be ground out.

The way to find out if there is loss of compression is to feel for it by slowly cranking the engine. To find if there is loss of compression in a certain cylinder, open all but one of the compression cocks and thus feel the compression in the cylinder having the closed compression cock. Then try the other cylinders in succession.

Loss of compression at the valve caps can be found by pouring a little oil around them and running the engine. If there is a leakage the oil will form in bubbles.

The Valve Timing.

From the first lesson the reader may be under the impression that the inlet valve is opened at the moment the piston is at the top starting down on the suction stroke and closes immediately the piston is down, having finished this stroke. This is not the case.

The usual practice is to have the inlet valve open slightly after the piston starts downward on the suction stroke, and remain open until the piston and, therefore, crank-pin has completed this stroke and has traveled upward on the next, or compression stroke, about one-sixth of the upward travel of the crank-pin, when it is closed.

The reason for having this valve open so long is due to the great speed of the engine. Many engines make about 1,200 revolutions in a minute when the car is traveling thirty-five miles per hour. From this you will see that the piston makes each stroke in about one-fortieth of a second.

This is a very short space of time, and you can readily understand, that as the incoming gases must pass through pipes and a valve, which tend to throttle or check their passage, they may not have time enough to get into the cylinder. It is to give the gases time enough to enter the cylinder that the inlet valve is held open for the extra one-sixth of the crank-pin travel as mentioned above.

Because of the great engine speed, the exhaust is also open for a comparatively long time, it being opened when the crank-pin has still to travel one-sixth of the way down on the stroke before the exhaust, or power stroke. It is held open for the full upward exhaust stroke, and slightly after completing this stroke.

The reason is this: the gases, after explosion, are under a very high pressure, and while they lose most of this pressure in pushing the piston down, when the power stroke is completed, they will still be under considerable pressure. Now, if there were still to be pressure in the cylinder when the piston starts on its suction stroke, there would be no suction due to the downward travel of the piston, as the old gases would simply expand until their pressure was gone.

So, you see, that there must also be considerable time allowed to let the exhausted gas lose its pressure, or, in other words, come to atmospheric pressure. Thus the valve is opened about one-sixth of the way before the beginning of the exhaust stroke.

From the above we see that the inlet valve opens when the crank-pin has traveled about ten degrees past top center on the suction stroke and closes about thirty degrees after the crank-pin has completed the suction stroke, and is on the compression stroke. The exhaust valve opens about thirty-five degrees before the beginning of the exhaust stroke, and closes about five degrees after the completion of this stroke.

As some of my readers may not be familiar with degrees, I will take the liberty of explaining what is meant by a degree.

If a circle be divided into 360 equal parts, each one of these parts will be one degree. Thus, in a circle thirty-six inches in circumference, thirty-six divided by 360, or one-tenth of an inch, will be one degree, while if the circle be 120 inches in circumference, 120-360, or one-third of an inch, will be one degree.

Thus there are 360 degrees in a circle, no matter how large. As the crank-pin is constantly traveling in a circle, when it has passed through one-fourth of a revolution, it will have traveled through ninety degrees, one-sixth of a revolution, sixty degrees, and so on. As a stroke is but one-half of a revolution, one-sixth of a stroke will be thirty degrees.

Figure 3 is a diagram showing the points as the various strokes begin.

In the next article we will take up the question of ignition.

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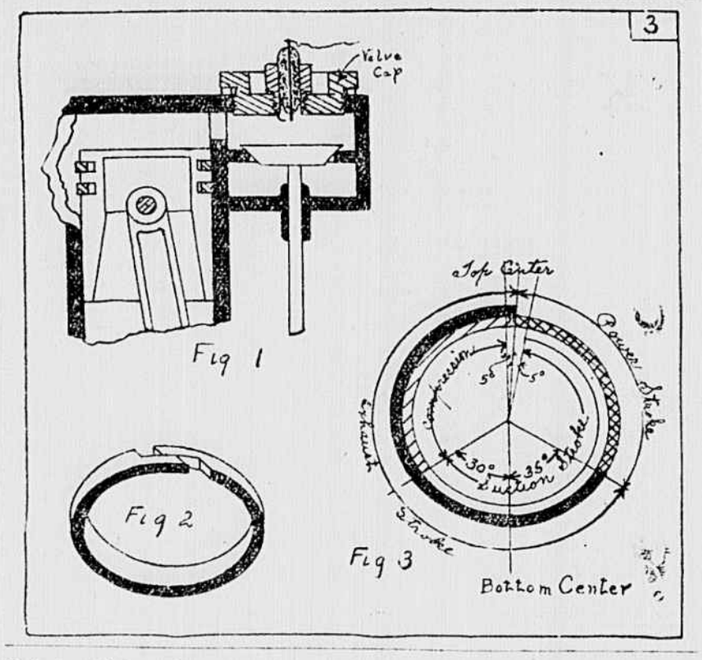
Diagram Showing Use of Piston Rings



AUTO QUERIES AND ANSWERS

[If you have any problems, or wish any information about your automobile, write the Auto Editor, The Times-Dispatch, and answers will appear under this heading.]

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Q. Dear Sir.—When I walk in back of my car, I notice that there is a strong smell coming from the exhaust, and sometimes black smoke. As I don't often see this in other cars, I am wondering if something is wrong with my car. Does this smoke and smell indicate anything? You will oblige. F. L. M.

A. Both the black smoke and the bad odor are a sure indication that your mixture is too rich. I would advise you to have your carbureter adjusted.

Q. Dear Sir.—I am considering the purchase of either a (——) or an (——) car. Which would you recommend, and why? Any information you give me to help me decide properly will be much appreciated. A. C. H.

A. For various reasons we cannot answer questions of this kind.

Q. Gentlemen.—The side lights in my 1914 (——) car burn very dim, yet the headlights are bright. I put new bulbs in but it did no good. I notice that when I pull out the little knob to prime my carbureter that the lights get bright. I have carefully traced the wire from the battery to the lights, and even pulled it out of the metal tube which protects it, to find a bare or loose wire. As my tail light sometimes acts the same way, I would like to find the trouble, and any suggestions you might give will be appreciated. I am, yours truly, W. M.

A. This car has what is known as a single wire lighting system, that is, one in which the current is led to the lights by a wire, but returns through the metal parts of the car. Your trouble is, undoubtedly, due to the fact that the lamp brackets do not make a metallic connection with the metal parts of the car, paint, japan, etc., acting as an insulation. The reason your lights get bright when you prime the carbureter is probably that the wire running to the carbureter ticler comes in contact with the metal shield of the light wire, and in this way makes a good connection between the light and the ground. I would recommend that you scrape the paint off a small portion of this shield, twist a wire about it and connect the other end of the wire to some metal part of the car.

Q. Dear Sir.—While my electric horn used to make a loud sound now it only gives a weak one. My battery is in good condition and well charged. Is there some way in which these electric horns can be adjusted to give a greater sound? G. D. P.

A. The sound of practically all electric horns can be regulated. If you will take off the cover of the motor you will find a little screw, having a lock nut on it, by which the rachet can be brought closer to or farther from the diaphragm, in this way varying the sound of the horn. Before adjusting this you would give the horn brushes and commutater a thorough cleaning with gasoline, and also make sure that all connections are tight. Again, your horn may need a new platinum point on the diaphragm.

Q. Dear Sir.—When driving at night I am bothered by the reflection in my windshield of the lights which are in back of me, so that I sometimes think they are in the front. Is there anything which can be put on the windshield glass to stop this. You will greatly oblige. F. H.

A. If you will adjust your windshield so that it is slightly at an angle to the vertical, the bottom pointing toward the front of the car, you will not be troubled by the reflections you mention.

Q. Dear Sir.—A short time ago I bought a set of second-hand electric lights and storage battery and put them on my car

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